

## Chapter 12

### Estimating Costs for Contracted GPS Surveys

#### 12-1. General

Developing cost estimates for GPS surveys is not markedly different from estimating conventional traverse or topographic mapping surveys. Similar production factors directly affect the ultimate cost: number of available GPS receiver units, daily productivity rates, survey accuracy criteria, network redundancy requirements, and required observation time per station. These factors are discussed in detail in previous chapters of this manual. Once the number of GPS observations for a given project has been determined, then the total field survey time and subsequent costs can be computed. Office data reduction and adjustment functions are performed and cost estimated identically to that of conventional survey work. The explanations herein regarding procurement policies and practices describe only the framework within which cost estimates are used. For detailed guidance on procurement policies and practices, refer to the appropriate procurement regulations.

#### 12-2. Hired Labor Surveys

Developing cost estimates for USACE field forces engaged in GPS surveys is performed similarly to that of conventional topographic survey work. Normally, an average daily rate of personnel, travel, per diem, and equipment is established. The GPS instrumentation rental rate is established at the time of purchase and is periodically updated based on actual utilization rates as charged against projects. Fringes, technical indirect, and direct overhead costs are added to a field crew's direct labor. The GPS survey crew rate should be recomputed at least annually, or more often if GPS instrumentation and other plant rental rates change significantly.

#### 12-3. Contracted GPS Survey Services

In accordance with current laws and regulations, GPS surveying services must be procured using qualification-based selection procedures in accordance with PL 92-582 (Brooks Act). GPS services may be included as part of a fixed-price (single project scope) A-E design contract or included as a line item on an indefinite delivery type (IDT) surveying and mapping A-E contract. In some instances, a fixed-scope GPS service contract may be issued. In all cases, GPS surveying services will be

negotiated as part of the A-E selection process; therefore, a Government cost estimate for these services must be prepared in advance of formal negotiations with the contractor.

*a. Contract types.* Fixed-scope GPS service contracts are not common; in most cases, USACE Commands obtain GPS services via the IDT contracting methods. One or more delivery orders may be placed against the IDT contract for specific projects. An overall contract threshold is established--currently \$750,000 per year/contract; thus, the accumulation of individual orders cannot exceed this limit. Individual orders placed against the basic contract are normally limited to \$150,000. The term of an IDT contract is usually set at 1 year; however, an option for year extensions may be authorized. Separate project scopes are written and negotiated for each order. The unit prices established in the basic IDT contract are used as a basis for estimating and negotiating each delivery order. The basic unit prices (U/P) in an IDT contract are established as part of the A-E acquisition and negotiation process; therefore, a Government cost estimate for these services must be prepared in advance of formal negotiations with the contractor. These basic unit prices must adequately represent the anticipated work over the course of the IDT contract--typically a 1-year period. (Separate rates are negotiated for additional option years.) Deficiencies in these unit rates will impact subsequent delivery order negotiations.

*b. Unit price basis.* A number of methods are used for scheduling GPS services in a fixed-price or IDT contract. The daily rate basis is the cost for a GPS field crew (including all instrumentation, transport, travel, and overhead) over a nominal 8-hr day. This rate method is normally used only on IDT contracts. This pricing method has advantages and drawbacks which need to be considered prior to determining.

(1) A daily crew rate estimating basis is the preferred unit price basis in estimating contracted GPS services for both fixed-price and IDT contracts. It provides the most flexibility for IDT contracts, especially when individual project scopes are expected to vary widely. It is, therefore, considered a more accurate method of determining costs for individual delivery orders. One disadvantage is that a detailed independent government estimate (IGE) must be developed for each delivery order placed against an IDT contract.

(2) The daily rate for a GPS surveying crew must be estimated using the following USACE-directed detailed

analysis method. The crew personnel size, number of GPS receivers deployed, vehicles, etc., must be explicitly indicated in the contract specifications, with differences resolved during negotiations. Options to add additional GPS receiver units (along with personnel and/or transport) must be accounted for in the estimate and unit price schedule. The seven-item breakdown for estimating costs is listed in Table 12-1.

**Table 12-1**  
**Factors for Estimating Costs**

Item	Description
I	Direct labor or salary costs of GPS survey technicians: includes applicable overtime or other differentials necessitated by the observing schedule.
II	Overhead on Direct Labor.
III	G&A Overhead Costs (on Direct Labor).
IV	Material Costs. <sup>1</sup>
V	Travel and Transportation Costs: crew travel, per diem, etc. Includes all associated costs of vehicles used to transport GPS receivers. <sup>1</sup>
VI	Other Costs: includes survey equipment and instrumentation, such as GPS receivers. GPS receiver costs should be amortized down to a daily rate, based on average utilization rates, expected life, etc. Exclude all instrumentation and plant costs covered under G&A, such as interest. <sup>1</sup>
VII	Profit (To be computed/negotiated on individual delivery orders per EFARS Part 15).

1. Government audit must confirm if any of these direct costs are included in overhead.

(3) A typical contract price schedule using the daily rate basis is shown in Table 12-2. This schedule may be modified as necessary to reflect larger GPS receiver and personnel inventories.

(4) Another advantage of a daily rate basis unit of measure (U/M) is that it is not dependent on the type or order of accuracy of the GPS survey being performed. Either static or kinematic GPS surveys can be estimated and negotiated using this cost basis.

#### 12-4. Verification of Contractor Cost or Pricing Data

Regardless of the cost rate method used, it is essential (but not always required) that a cost analysis, price analysis, and field pricing support audit be employed to verify

all cost or pricing data submitted by a contractor, in particular, actual GPS instrumentation utilization rates and reduced costs per day. GPS equipment and instrumentation costs represent a major portion of a field crew's costs, and these cost rates are currently extremely variable. Some GPS operation and maintenance costs may be direct, or portions may be indirectly included in a firm's General and Administrative (G&A) overhead account. In some instances, a firm may lease/rent GPS equipment in lieu of purchase. Rental rates average 10 to 15 percent per month of the purchase cost, or \$4,000 to \$6,000 per month (1994). Rental would be economically justified only on limited scope projects and if the equipment is deployed on a full-time basis. Whether the GPS equipment is rented or purchased, the primary (and most variable) factor is the GPS equipment's actual utilization rate, or number of actual billing days to clients over a year. Only a detailed audit and cost analysis can establish such rates and justify modifications to the usually rough assumptions used in the IGE. In addition, an audit will establish any nonproductive labor/costs which are transferred to a contractor's G&A. Given the highly changing equipment costs and utilization rates in this new technology, failure to perform a detailed cost analysis and field pricing support audit on contracted GPS services will make the IGE difficult to substantiate.

#### 12-5. Sample Cost Estimate for Contracted GPS Survey Services

The following cost computation is representative of the procedure used in preparing the IGE for an A-E contract. It is developed for a two-receiver, two-man, two-vehicle GPS field survey crew and based on a standard 8-hr workday. Larger crew/receiver size estimates would be performed similarly. Costs and overhead percentages are shown for illustration only--they are subject to considerable geographic-, project-, and contractor-dependent variation (e.g., audited G&A rates could range from 50 to 200 percent). GPS instrumentation rates are approximate (1994) costs. Associated costs for GPS receivers, such as insurance, maintenance contracts, interest, etc., are presumed to be indirectly factored into a firm's G&A overhead account. If not, then such costs must be directly added to the basic equipment depreciation rates shown. Other equally acceptable accounting methods for developing daily costs of equipment may be used. Equipment utilization estimates in an IGE must be subsequently revised (during negotiations) based on actual rates as determined from a detailed cost analysis and field price support audits.

**Table 12-2**  
**Daily Rate Basis Contract Schedule**

Item	Description	Quan	U/M	U/P	Amount
0001	Registered/Licensed Land Surveyor -- Office	[1]	Day		
0002	Registered/Licensed Land Surveyor	[1]	Day		
0003	Civil Engineering Technician -- Field Party Supervisor (Multiple Crews)	[1]	Day		
0004	Engineering Technician (Draftsman) -- Office	[1]	Day		
0005	Supervisory GPS Survey Technician (Field)	[1]	Day		
0006	Surveying Technician -- GPS Instrumentman/Recorder	[1]	Day		
0007	Surveying Aid -- Rodman/Chainman {Conventional Surveys}	[1]	Day		
0008	[Two][Three][Four][___]- Man GPS Survey Party  [___] GPS Receiver(s) [___] Vehicle(s) [___] Computer(s)				
0009	Additional GPS Receiver	[1]	Day		
	{Add Item 0006 Observers as Necessary}	[1]	Day		
0010	Station Monuments [Disk Type] [Construction Materials]	[1]	EA		
0011	Professional Geodesist Computer (office)	[1]	Day		
0012					
0013					

a. *Basic daily crew rate cost estimate.*

(1) Direct Labor.

Supervisory Survey Technician (GPS  
Observer) @ \$20,000/year or \$77/day  
Survey Technician @ \$16,000/year or \$62/day

Total direct labor: \$139/day

(2) Overhead on direct labor:

@ 30% of direct labor \$42/day

(3) G&A overhead:

@ 100% of direct labor \$139/day

(4) Materials and supplies:

\$20/day

(5) Travel and transportation expenses:

Vehicle depreciation:  
\$17K base @ 5 years @  
220 days/year \$15/day

Operation and maintenance  
(fuel, oil, etc.)

\$15/day

Total: Two vehicles @ \$30/day ea \$60/day

Per Diem: average assumed for IDT  
locale; rate not to exceed published  
General Services Administration (GSA)/Joint  
Travel Regulation (JTR) levels

Total: Two men @ \$50/day each \$100/day

(6) Other costs:

(Miscellaneous survey instrumentation/equipment, tools  
and equipment (T&E), etc., normally included in G&A  
overhead.)

GPS receivers (2 each) plus  
386-based field computer

Receivers: 2 @ \$20K ea \$40,000  
Computer + software: \$10,000  
Total: \$50,000

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5-year depreciation base --  
 assumed average utilization  
 of 200 days per year with  
 maintenance included in G&A rate

Total: \$50K @ 5 years @ \$200/day) \$50/day

(7) Profit: Profit is not computed on the basic contract but is determined for each separate order based on the guidance contained in Part 15 of the EFARS.

Total Estimated Rate: \$550/day

*b. Additional GPS receiver.*

Direct Labor (Survey Technician)	\$62/day
Overhead on direct labor @ 30%	\$19/day
G&A @ 100%	\$62/day
Material and supplies	\$5/day
Travel and transportation:	
Vehicle	\$30/day
Per diem	\$50/day
Other costs: GPS Receiver	
One receiver \$20K @ 5 years @	
200 days/year	\$20/day

Total: \$248/day

*c. Travel and per diem.* The contract schedule must equitably account for actual travel and per diem expenses if a constant temporary duty locale is not involved, or if the per diem rate varies considerably from that estimated for an IDT contract. Some USACE Commands include crew per diem as a separate line item on the schedule or develop a schedule containing local and travel crew rates.

*d. Delivery orders.* Since unit prices (either daily rates or work unit rates) have been established in the basic contract, each such delivery order is negotiated strictly for effort. The negotiated fee on a delivery order is then a straight mathematical procedure of multiplying the agreed-upon effort (time or unit of measure quantity) against the unit prices, plus an allowance for profit. Thus, an IGE is required for each order placed, along with a detailed profit computation, documented records of negotiations, etc. The scope is attached to a DD 1155 order placed against the basic contract. The process for estimating the time to perform any particular survey function, in a given project, is totally dependent upon the knowledge and personal field experience of the Government estimator.